

ORIGINAL
ARTICLE**Does Morphine Administration Consequences Missing of Spinal Fracture Patients in the Emergency Ward?**Motahare Anvari¹, Naser MohammadKarimi¹ , Ali Race¹ , Mehdi Afshari¹,Mohamadali Jafari¹  , Farzaneh Dehghan² ¹ Department of Emergency Medicine, School of Medicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran² Department of Internal Medicine, School of Medicine, Shahid Rahnemoun General Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

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Abstract

Introduction: Studies have shown that factors that distract the patient from pain, such as more pain in other parts of the body or the use of analgesics, can impair the process of fracture diagnosis by reducing the patient's sensitivity to the presence of tenderness during the doctor's examination. This study investigated the effect of using analgesics as a distracting item in patients with traumatic cervical pain and tenderness and determined whether prescribing and administering analgesics to these patients caused patients with noticeable bone lesions to be examined less accurately. It also explored whether the correct administration of analgesics reduces the use of radiography.

Methods: A total of 62 trauma patients with midline cervical pain who met at least one criterion for cervical CT scan imaging and required analgesics as diagnosed by the physician were included in this cross-sectional study. First, the patients' pain scores were measured and recorded according to the Visual Analogue Scale (VAS) during the spinal examination. Subsequently, morphine at a dose of 0.05 mg/kg was administered intravenously. The pain scores of the patients were then recorded during the spinal examination at baseline and 30 minutes after administration. Subsequently, the patients were subjected to a CT scan of the cervical vertebrae, and the relationship between the pain score of the patients and the results of the CT scan was investigated.

Results: The mean pain score significantly decreased in patients with a normal condition (Not Presence of Fracture) after injection ($P=0.004$), but this difference was not significant in patients with a fractured spine, indicating that there was no improvement in pain with the administration of morphine in patients with serious cervical injuries ($P=1.000$).

Conclusion: In patients with cervical spine fractures, the administration of morphine did not completely alleviate the pain.

Key words: Emergency ward, Morphine Dependence, Opioid Analgesic, Pain Management, Spinal Fractures

Introduction

Trauma is one of the leading causes of mortality and disability in the first four decades of life. Cervical vertebrae injuries comprise only 5-10% of all non-penetrating trauma patients, yet they are vital due to the high rate of dangerous complications, including limb paralysis (1). The

causes of cervical injury are trauma caused by motor accidents, falls from heights, violence and fights, and sports injuries. These injuries, which have permanent complications and are known as devastating disasters, will exert extensive psychological, social, and financial effects on the patients and their families (1, 2). There is no other location in the body than the cervical area where

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numerous important vital structures are packed into such a small and confined space. The main vessels, nervous and digestive channels, the spinal cord, esophagus, and spinal and carotid arteries that supply the brain's blood supply are located in the neck. If the cervical spine injury does not receive sufficient prompt attention, it can quickly cause a person's death due to airway obstruction and suffocation (3).

Ultimate management of cervical spine injuries is directed by the degree of instability of the fractures and can be managed medically (with analgesic) or operatively. The benefits of surgery must be weighed against its potential risks on a case-by-case basis (2). Pain complaints are one of the most prevalent conditions among trauma patients in hospital emergency settings. Pain in trauma plays a role similar to a double-edged sword (3). On the one hand, pain is a good indicator for determining the severity and type of injury. On the other hand, alleviating pain may lead to the patient or doctor's denial of the problem (3). Thus, knowing how to manage trauma patients is an important part of a systematic approach to trauma response. Prompt identification and appropriate management of patients with acute cervical injury in the ED is critical due to the devastating and catastrophic effects of spinal cord injury (3). On the other hand, reducing pain increases patient satisfaction and prevents physical and mental disorders such as intractable pain syndrome and anxiety caused by post-traumatic stress disorder (PTSD) (4). The selection of the type and dosage of analgesics for these patients varies based on the patient's condition. Moderate to severe pain is usually treated pharmacologically with intravenous (IV) opioids (4). Although cervical spine radiography is almost routine in many emergency wards, computed tomography (CT) scan provides more detailed information and should be considered. The CT scan technology is an alternative to radiography in many medical clinics because it is much better at detecting subtle cervical spine injuries. Given that proper treatment of cervical trauma injury is important in diminishing the risks of paralysis and mortality, CT scan can be very effective in the treatment of patients with moderate to high-risk cervical trauma due to its potential for detecting subtle injuries (5).

National Emergency X-Radiography Utilization Study (NEXUS) criteria or the Modified Canadian Cervical-spine rule (CCR) are guidelines for imaging cervical vertebrae in blunt conventional simple X-rays or CT scans without putting cervical trauma patients at risk of not diagnosing the injury (6). One of the important cases in this criterion is the

presence of tenderness in the cervical vertebrae during the doctor's examination of the patient. Studies have indicated that factors that distract the patient from pain, such as more pain in other parts of the body or the use of analgesics, can impair the process of fracture diagnosis by reducing the patient's sensitivity to the presence of tenderness during the doctor's examination (7). These items are called distracting items or injuries. This study investigated the effect of using analgesics as a distracting item in patients with traumatic cervical pain and tenderness and determined whether prescribing and administering analgesics to these patients caused patients with noticeable bone lesions to be examined less accurately. It also explored whether the correct administration of analgesics reduces the use of radiography.

Methods

This descriptive-analytical and observational study was carried out using the ethics code IR.SSU.MEDICINE.REC.1398.253. The study population consisted of all trauma patients referred to Shahid Rahmehoon Hospital and Shahid Sadoughi Hospital in Yazd during 2017-2018; from this community, trauma patients with midline cervical pain who needed analgesics as diagnosed by the attending physician were included in the study.

The sample size was calculated by considering the approximate amount of 80% for the sensitivity of the test and considering the error of $d = 0.1$ and the number of 62 patients.

$$n = \frac{z^2 P(1 - P)}{d^2} = 62$$

Inclusion criteria included being over 18 years of age, suffering from blunt cervical trauma requiring a diagnostic CT scan, according to National Emergency X-Radiography Utilization Study (NEXUS) criteria or the Modified Canadian C-Spine Rule (CCR) criteria, posterior midline tenderness in the cervical spines, and the need for analgesic injection due to pain as determined by the attending physician.

Exclusion criteria included opioid addiction, penetrating cervical trauma, acute and recent burns in the cervical area, unstable hemodynamics, lack of consent to participate in the study or withdrawal of cooperation, Glasgow Coma Scale (GCS) < 15, intoxication, contraindications for morphine administration, such as history of drug sensitivity and history of asthma, and specific history of previous cervical diseases like cervical arthritis or rheumatic diseases.

The patients who needed analgesic injections

according to the doctor's diagnosis were included in the study. Demographic and clinical information of the patients, such as age, gender, GCS score (7), and pain score (8) of the patients during the cervical spine examination, were measured and recorded based on the Visual Analogue Scale (VAS). Then, for the patients under study, morphine (9) was administered intravenously at a dose of 0.05 mg/kg. Besides, 30 min after the administration, the patient's pain score was measured again and recorded during the examination. According to the clinical need for a CT scan, all patients underwent a CT scan to diagnose the fracture definitively. The interpretation of this imaging was performed by a radiologist. Finally, a definitive diagnosis of fracture or non-fracture in the cervical vertebrae was recorded based on a CT scan.

Data were analyzed by the SPSS (version 21) software using paired (before and after morphine administration) and independent T-test (between Presence and Not Presence of Fracture). In addition, $P < 0.05$ was considered to be the significance level.

Results

There were 138 patients with cervical blunt

trauma who arrived at the emergency ward. Among them, 7 (5.07%) were unstable hemodynamic patients, 25 (18.11%) had a GCS < 15 , 17 (12.31%) had penetrating trauma to the cervical region, 9 (6.52%) had distracting injury and pain, 13 (9.42%) had a history of opioid abuse, and 6 (4.34%) had alcohol abuse.

The present study was conducted on 62 trauma patients aged 18-62 years and the possibility of fracture of the cervical vertebrae with pain in the midline of the cervical area, 39(62.9%) male and 23(37.9%) female.

The mean pain score significantly decreased in patients with a normal condition (Not Presence of Fracture) after injection ($P=0.004$). However, this difference was not significant in patients with a fractured spine, indicating that there was no improvement in pain with the administration of morphine in patients with serious cervical injuries ($P=1.000$) (Table 1).

It was found that 90.32% of the patients had no fracture in the vertebrae in the CT scan, and 9.67% of the cases were reported with spinal fractures. In this study, no drug complications were reported after morphine injection in the studied patients.

Table 1. Mean pain score of patients before and after morphine administration by diagnosis based on CT scan results

Diagnosis based on CT scan n=62	N (%)	Before morphine injection	After morphine injection	paired t-test
		Mean \pm SD	Mean \pm SD	
Not Presence of Fracture	56(90.3)	7.09 \pm 2.95	6.16 \pm 2.84	$P=0.004$
Presence of Spinal fracture	6(9.6)	6.20 \pm 3.03	6.20 \pm 3.49	$P=1.000$
Independent t-test		$P=0.87$	$P=0.047$	

Discussion

The results of the study revealed that patients with cervical spine fractures had less pain alleviation after morphine administration than non-fractured patients. This result means that the administration of morphine did not cause a denial of pain by the cervical fracture patient. In a similar study, while treating with IV acetaminophen for patients with suspected traumatic injury of the cervical spine, they evaluated the reduction in the need for imaging methods to evaluate the cervical spine. After administering acetaminophen (15 mg/kg) to patients with acute blunt trauma to the cervical area and cervical tenderness in the posterior midline, the researchers subjected all patients to plain radiography and CT scan of the cervical spine and re-examination for the presence of tenderness in the midline 60 min after acetaminophen infusion. They concluded that the administration of analgesics can play a role in

reducing the need for imaging in patients suspected of cervical spine trauma (10).

In the study conducted by Farsi et al., a significant reduction in pain was observed after IV morphine injection with 0.15 mg/kg in cervical trauma patients (11). The results of their study indicated that cervical spine trauma patients with normal X-rays could be discharged from the hospital if morphine reduced their pain. These patients did not require any CT scans because their pain was caused by muscles and non-bony structures in the cervical spine area, which did not indicate the presence of missed spinal fractures.

The study by Sharifi et al., conducted in Mashhad on 67 patients, focused on the use of morphine to reduce the need for CT scans in cervical spine trauma patients. They concluded that a significant reduction in pain occurs with morphine. They asserted that patients with normal radiographs and reduced pain after morphine may not need a CT scan, indicating muscle-related pain in the cervical

spine region (12).

Some studies on the effect of methylprednisolone on acute cervical spine trauma pain did not show any improvement in patients' pain (5). The results of this study were consistent with our findings. In our study, a statistically significant decrease in the pain score after morphine injection was observed in non-fractured patients (based on CT scan results), which indicates the presence of pain in the muscle areas. It can be suggested that in these patients, only a simple cervical radiograph should be prepared; if it is normal, they do not need a CT scan. However, if the patient's pain scores do not alleviate, it may be due to a spinal fracture.

On the other hand, if the patient's pain score decreases by 3 points at the bedside, it is considered clinically valuable for the doctor. Nonetheless, in the present study, the decrease in the pain score was less than this rate, again confirming that the administration of analgesics does not cause complete elimination of pain.

In some cases, the neck pain might be due to mechanical neck pain (MNP), as another study revealed a probable relationship between the presence of trigger points in the shoulder and trapezius muscle and the occurrence of pain in patients suffering from mechanical or traumatic neck pain (13). The MNP is a condition characterized by pain in the neck, often affecting physical, psychological, and social functions. The presence of pain in most patients in our study might be a consequence of trigger points, and MNP revealed after morphine injection rather than a result of bone fracture.

Another study assessed acupuncture for treating MNP, which is a common issue affecting many people. The study emphasized the importance of training acupuncturists to ensure high-quality treatment, which could improve patient outcomes and safety in acupuncture practices. This approach could help identify more effective treatment options for patients suffering from neck pain (14).

In the present study, the age of the patients varied between 18 and 62 years; therefore, the results cannot be generalized to other groups, including children and the elderly.

The sample size of this study was small, and the authors suggest conducting the study with a larger number of patients to enhance the validity of the findings.

Conclusions

If the patient's pain is alleviated with the administration of morphine, there is a lower

likelihood of serious bone damage. Additionally, the pain may be a consequence of myofascial nociceptive pain (MNP). The results of this study did not indicate any missed management of neck trauma patients who received intravenous morphine sulfate.

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Conflict of Interest

The authors declare no conflict of interest.

References

1. Dodds N, Hollis S, Islam M, Thompson J. Anatomical injury patterns, demographics and outcomes data for blunt and penetrating neck injuries on the trauma audit and research network database. *Bulletin Royal College of Surgeons of England*. 2023;105(2):70-75.
2. Beeharry MW, Moqem K, Rohilla MU. Management of cervical spine fractures: a literature review. *Cureus*. 2021;13(4):e14418.
3. Cao S. Anesthesia for oral maxillofacial and neck trauma. *Anesthesia for Oral and Maxillofacial Surgery*: Springer; 2023:177-187.
4. Abdoli A, Ghahramani S, Seif-Rabiei MA, Salimi R, Heshmati B. Comparison of the effect of ketorolac and morphine on pain management in patients with spinal trauma in emergency department: a randomized controlled clinical trial study. *J Isfahan Med School*. 2019;37(528):556-563.
5. Go JL, Acharya J, Branchcomb JC, Rajamohan AG. Traumatic neck and skull base injuries. *Radiographics*. 2019;39(6):1796-1807.
6. Paykin G, O'Reilly G, Ackland HM, Mitra B. The NEXUS criteria are insufficient to exclude cervical spine fractures in older blunt trauma patients. *Injury*. 2017;48(5):1020-1024.
7. Balakrishnan B, VanDongen-Trimmer H, Kim I, Hanson SJ, Zhang L, Simpson PM, et al. GCS-pupil score has a stronger association with mortality and poor functional outcome than GCS alone in pediatric severe traumatic brain injury. *Pediatric Neurosurg*. 2021;56(5):432-439.
8. Bielewicz J, Daniluk B, Kamieniak P. VAS and NRS, same or different? Are visual analog scale values and numerical rating scale equally viable tools for assessing patients after microdiscectomy? *Pain Res Manag*. 2022;2022(1):5337483.
9. Wang J, Li Z, Tu Y, Gao F. The dopaminergic system in the ventral tegmental area contributes to morphine analgesia and tolerance. *Neuroscience*.

- 2023;527:74-83.
10. Ahmadi K, Hashemian AM, Pishbin E, Sharif-Alhoseini M, Rahimi-Movaghar V. Impact of intravenous acetaminophen therapy on the necessity of cervical spine imaging in patients with cervical spine trauma. *Chin J Traumatol*. 2014;17(04):204-207.
 11. Farsi D, Movahedi M, Hafezimoghadam P, Abbasi S, Shahlaee A, Rahimi Movaghar V. Acute pain management with intravenous 0.10 mg/kg vs. 0.15 mg/kg morphine sulfate in limb traumatized patients: a randomized double-blinded placebo-controlled trial. *Ulus Travma Acil Cerrahi Derg*. 2013;19(5):398-404.
 12. Sharifi MD, Doloo HZ, Hashemian AM, Tourghabe JT, Kakhki BR, Teimoori SJ, et al. Impact of morphine use in reducing the need for CT scan in patients with cervical spine trauma: a double blinded randomized clinical trial. *Electron Physician*. 2016;8(5):2432-2435.
 13. Liang Z, Thomas L, Jull G, Treleaven J. Cervical musculoskeletal impairments in migraine. *Arch Physiother*. 2021;11:27.
 14. Qiu XH, Yang XY, Wang YY, Tian SL, Yan YB, Xu AP, et al. Myofascial acupuncture versus routine acupuncture for mechanical neck pain: a protocol for a multicentre randomised controlled trial. *BMJ Open*. 2023;13(8):e068129.